

**My Internship at the
International Potato Center
Lima, Peru
for the
World Food Prize**

**By: Christiana Brevik
Bettendorf High School
October 2002**

“About Me”

My name is Christiana Brevik. As the daughter of an American mother and Norwegian father, I was born and lived in Trondheim, Norway, until the age of sixteen. At that time, I came to live with my grandparents in Bettendorf, Iowa, to attend Bettendorf High School.

Norway is a country that currently enjoys economic prosperity and there is virtually no poverty there. I have, however, visited third world countries where children beg for food. Perhaps that is why I responded as I did when my teacher, Dea Nelson, approached me with information concerning the 2001 World Food Prize International Symposium. I wanted to learn more about it and about Dr. Norman Borlaug, the only Iowan ever to travel to Oslo, Norway, and receive the Nobel Peace Prize. Denmark's Dr. Per Anderson received the World Food Prize for 2001.

I often think of my time in Peru and my memories of its kind people who made me feel welcome. My host family, the Bartolinis, helped me with my Spanish and made me feel at home. My co-workers helped me understand my responsibilities and perform my duties at the research center. It was a difficult time for me when a 24 year old co-worker who was to serve as my supervisor was killed in a disco fire before the Monday that she was to become my supervisor. The death of this vibrant young woman had a sobering effect on everyone at the research center. I still am sad when I think of it.

Location of Internship

This paper discusses my two month internship with the World Food Prize in Lima Peru. My work was done at the International Potato Center (“C.I.P.”) I have provided a description of my cultural experiences there, as well as a summary of the more technical aspect of the work of C.I.P. My cultural experiences are described so that a better understanding can also be gained about the ancient city Lima, and the beautiful and contrasting landscapes of Peru and its many cultures. I hope here to give you insight into the background where all these potato ventures take place.

I had been so involved in all the preparations for the trip, including the paperwork, the inoculations and the packing, I had not had time to anticipate what Peru would actually be like when I arrived. As it happened, I arrived in Lima, Peru, one hour late and in the middle of the night. I feared my ride might have given up on me and left the airport, but he had not. He was standing waiting for me with my name plainly written on the sign he carried and I knew that I was in the right place at the right time. He instructed me to go the car and stated that I would be safer waiting in the car and would be less likely to have something stolen. Evidently, Lima has a high rate of crime at the airport and other tourist attractions. I felt self-conscious while walking through the airport, partly because my looks are so different from the natives in Peru. My blonde hair and blue eyes were a stark contrast to the people around me.

My ride to my host family was definitely a wild one. I was aware that most of the people on the road were driving very fast and passing in ways that would be illegal in the United States. In a lane that should only have no more than two cars, sometimes up to

four cars would drive in that space. In addition, there are no lines on the pavement to give drivers a sense of the road's boundaries. I have visited countries where there are few driving rules, but I can say that the drivers in Lima, Peru, were the most unsafe drivers that I have ever seen.

I was excited to meet my host family. They were very welcoming and very helpful. I stayed in their large house that had ten bedrooms and accommodated many family members, including people from several generations. There was an infirm elderly grandmother and twenty-three grandchildren from various sons and daughters of the house's owner. My host family also had five maids who cooked the meals, washed the clothes by hand, scrubbed the floors, dusted and got the children up and ready for school. All the work was done without the electrical appliances that are standard equipment in American and Norwegian households.

Peru is a long, narrow coastal country (similar to Norway in that respect) which has beautiful landscapes. Living in Norway had prepared me for the mountains in Peru, but the mountains in Norway can hardly be called mountains in comparison with the majestic Andes in Peru. We took a trip into the Andes Mountains to participate in the potato harvest there with the native people from the highlands. It was an eight hour ride in the back of a pickup truck to the potato harvest and the trip was very cold. Even though it was summer in the United States, it was winter in Peru and I was not dressed warm enough for the winter, particularly in the highlands. The view of the mountains as we rode along was spectacular and made the trip worthwhile.



The view of the Andean Mountains on the trip to the potato harvest

When we arrived at the potato harvest, I was amazed to see the women working the harvest sites, often carrying a baby or small child on their backs. They had no tools for digging, and instead, simply used their bare hands. Also, I observed that the clothes the women were wearing were not as heavy and warm as the ones that I wore (and I was cold). The harvest scene really impressed me because these people have to work so hard just to have enough food to eat, which is such a stark contrast to America and Norway where there is such an abundance of food for most people. I know that I will never again look at a grocery aisle in one of our many supermarkets and take it all for granted. Many people worked and labored to produce the food in the supermarket that we can merely grab and put in our carts.

I can say that I saw many beautiful sights in Peru. Peru has several different distinct geographic regions including the highlands, the area along the coast and the

jungle. In the coastal area by the sea there is much fishing and much water transport commerce. There are many huge ships in the coastal area, both for fishing and transportation.



The coastal area of downtown Lima

The third region that I visited was the jungle where they grow fruits, vegetables and coffee. They grow bananas, oranges, papaya and avocados in the jungle areas.



Coffee processing lab near San Ramon in the jungle of Peru

Peru's regions are not far apart, but they differ greatly, so much so that you feel that you are going from one country to another. Each region has different customs, standards of living, traditions, work and food. Even the home dwellings differ. Also, in the highlands they speak an old language that predates the arrival of the Spaniards. It is called Quechua and derives from the Incas. It is very different from the Spanish spoken in the other regions. In the highlands the people live mostly on the food that they raise themselves. They are very poor. Many people live without running water and do not have modern conveniences. Only recently has electricity been available to most of the people in this region.

Many people in Peru come from the rural regions to seek a better life in Lima. Thus, that city of millions of people is a place of disappointment for many. The hoped for jobs are not available and the women become maid servants while the men drive taxis. Sixty percent (60%) of Lima's vehicles are taxis. Lima seemed crowded, had much pollution and many buildings. Lima had a lot of diversity within the city itself. The sections of the city are segregated by the wealth of the occupants. Some of the older areas have beautiful houses and magnificent churches where you can see no poverty. The people living in the wealthy areas are totally isolated from the pockets of poverty.

Many people in Peru, as in other countries, complain about their system of government. There were several anti-government demonstrations taking place against Peru's President during my short stay there. Upon asking the locals about the demonstrations, they stated, "prior to taking office, he made promises to provide better jobs and living conditions, but has not delivered on those promises."

C.I.P. Experiences

I did not have to go to work at the research center the first day after I arrived because they were having a national holiday in honor of Peru's former and much-loved president. But on the second day after I arrived in Lima, I was up at 6:00 A.M. and left for work at 7:00 A.M. My host parents both worked at the research center and they took me to work each day. Because of the erratic driving, the ride to work took about half an hour, even though the research center was very close to where I lived.

Upon my arrival at the research center, I was introduced to my co-workers and given a tour of the facility. It is well named as the International Potato Center, which is the English translation of its Spanish name. The compound included departmental buildings, greenhouses, gene banks, fields of all kinds of potatoes and laboratories for studying the numerous varieties of potatoes and the diseases and insects that can thwart the growth and production of potatoes. The compound also included various sporting fields, racquetball courts and a gymnasium where workers could take part in exercising or playing games during their breaks from work.

As to my specific endeavors, I did not focus on any single task, but rather, worked in the lab, in the green house and sometimes in the field. I made myself available to do whatever I was asked and felt fortunate to have some association with numerous workers. During my time working at the center, I gained some knowledge of the entire operations conducted there.

Even at C.I.P. there were two separate cafeterias--one for the laborers and other workers without a higher education, and one for the scientists, directors, secretaries and higher paid employees. The food served in each cafeteria and the corresponding portions also differed. For example, the laborers' cafeteria served larger portions and less fancy food than the cafeteria for the higher paid employees. All of these contrasts between classes lead me to conclude that there is an obvious difference in the social classes in Peru.

It is in this environment that the people at C.I.P work tirelessly to improve the country's main crop and food staple. It is in Peru that the potato originated. While the small farms in the highlands are a vital part of the potato industry, the farmers themselves are paid little for their efforts. It would be very beneficial to them if they could find a market for their crops outside Peru. The truth is that Peruvians have very little money for food and they prefer foreign food to their own.

The C.I.P. in Lima, Peru, was the setting of my World Food Prize research from June 5, 2002, until August 2, 2002. I worked generally in the conservation and evaluation of potato root and tuber biodiversity. My experimental study is entitled "Conservation of the Genetic Resources of Root and Tuber Crops." This research included conservation in the field and in vitro maintenance in the lab using the potato gene bank. Genetic biodiversity analysis was then conducted.

Goals and Mission of My Internship

Before the presentation ended and especially after hearing the reports from the other students who had taken part in the World Food Prize International Symposium last year, I knew that I wanted to learn more about and become a part of the program. I was honored to be chosen as a participant to go to Peru and work with scientists in a world renowned research center. On June 5, 2002, I departed the Des Moines Airport to fly to the distant and ancient land of the Incas.

The goal of the program at C.I.P. is to increase potato production and varieties, to decrease diseases and insect infestation, and to further genetic studies, with the ultimate goal of improving the health and overall life of the people of Peru and the world.

My general working hypothesis is that with increased understanding about the value of specific genetic resources of potatoes, the more likely these genetic resources will remain utilized on local farms and in gene banks. Interesting results during testing identified those plants that were more resistant or had higher vitamin content than others.

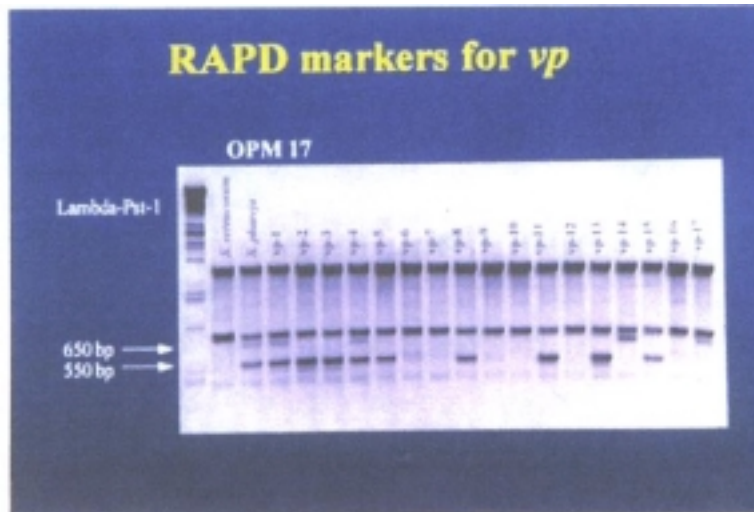
The reason for researching this topic was to prove that virus and pathogen-free potatoes, sweet potatoes and other tuber crop plants can be produced and stored in a gene bank for international distribution. In vitro plantlets will be “cleaned” of pathogens to maintain genetic resources in healthy conditions. These plantlets were used at C.I.P. to evaluate crop genetic resources with special properties that make them valuable for agriculture, to be shared with researchers and farmers around the world.

Background of C.I.P.

To improve crop quality and production, testing was done for disease and pest resistance to find resistant plants and genes in the gene bank. Plants that have genetic resistance are naturally protected against diseases and pests, such as those caused by fungi and different viruses. Farmers can use these “cleaned” plants to grow their crops with less use of pesticides that are damaging to health and the environment. Root and tuber crops are especially sensitive to virus diseases because viruses can survive for many generations in their planting material.

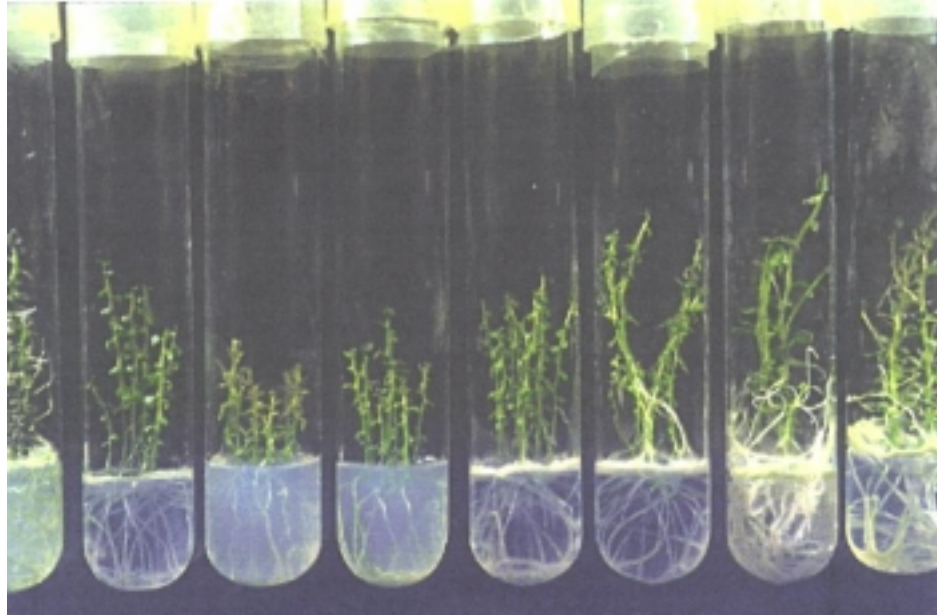


In the biology lab working with DNA markers



This is an example of a part of a gene from the DNA of a plant.

Annually, farmers plant the tubers or roots they harvest from their fields to start their new crop for the next year, instead of harvesting seeds, as for corn, beans, rice, wheat, or many other crops. Year after year, viruses accumulate in roots and tuber crops, weakening them, and leading to poorer yields and diminishing quality of the harvested product. In many cases, fungal diseases can destroy a farmer's crop in a matter of weeks. Nematodes are also threatening pests to both sweet potatoes and potatoes. Farmers may either suffer reduced yield or quality, or they may apply toxic pesticides to the soil to protect their crops from nematodes. To help them, C.I.P. is trying to find changes in the plants' DNA after conception by in vitro conservation versus those planted in the field. They do this by analysis of genetic stability, which is an important aspect of ex-situ conservation.



This is the propagated potato plantlets in the test tubes being “cleaned” in the gene bank.

C.I.P. tests for nutritional and quality factors that make crops more useful as raw edible foods or as processed products. The vitamin contents vary among the genetic resources of crops such as sweet potato or potato, and are sometimes associated with the color of the root or tuber. For example, red, orange or purple potatoes have higher vitamin and mineral contents than white potatoes. C.I.P. has found that the potatoes from the highlands (originally used only by locals) have higher vitamin and mineral content and are satisfactory for processed chips.



Here I am studying my work in the jungle gene bank.

The payoff for the locals is generated revenue. Some Andean potato varieties that are so far grown only for home use by poor farmers also have ideal qualities for processing as potato chips. Linking poor farmers with new markets in the cities, or even internationally, will help to generate income.



Examples of native potatoes from the Andean Mountains of Peru

Sugar content and dry matter content determine the type of potato produced. Sweet potato plant breeders use genetic resources with higher vitamin content to develop more nutritious varieties. This type of genetic breeding is helpful to the native people of Africa who like white sweet potatoes that are deficient in beta carotene. Such deficiencies in beta carotene have contributed to high mortality rates for children and nursing mothers who have vitamin A deficiencies. Cross breeding is done between those sweet potatoes higher in beta carotene and that are high in dry matter content but susceptible to pests and disease with those sweet potatoes that have lower vitamin content but are less susceptible to pests and disease.



This picture demonstrates cross breeding by hand. The second method of cross breeding is by cross pollination using bees.

My Responsibilities and Contributions



This picture depicts me propagating plantlets in C.I.P.'s gene bank.

I have helped to conduct six different experiments in biodiversity evaluation and have helped test specific hypotheses about genetic variability for resistance to pests and pathogens affecting the nutritional value of potatoes and sweet potatoes. In addition, I have also learned about some of the routine methods of practice for conservation of plant resources.



This picture depicts propagating by cutting the plantlets.

I was given five topics to explore. My first topic was to see if a reaction occurred when leaves were inoculated with different varieties of potatoes with the “late blight” fungus. These plants are planted in the field to see how the whole plant responds to disease pressure. Resistant clones are identified for use in plant breeding.



This is an example of a potato plant that has been infected with “late blight.”

My second experiment was to determine which potato plants were infected and which were healthy from virus infections. My third experiment was to determine which sweet potato plants were susceptible to nematode infection, and which were resistant. My fourth experiment was to determine which potato varieties were suitable for use in making potato chips, and which were not suitable. These experiments were designed to determine the range of variability of the vitamin content in farmers’ potato varieties. My final experiment was to recombine the useful characteristics of different sweet potato genetic resources into improved varieties.

Results of My Research

Globally, genetic plant resources are of great value to humanity, providing nations and peoples with food, fiber, shelter and medicine. More specifically, they provide the energy, nutrition, clothing, and roofing of our homes. Plant breeders and researchers are continually developing improved crop varieties for farmers who use these genetic

resources in their crop production systems. The major benefits of these new genetic varieties will be an increase in the nutritional value of crops and increased production of reliable harvests without the use of toxic chemicals. Genetic resource evaluation is most beneficial today as it will in the future.

One of the important aspects of these routine methods of tissue culturing is that the approach for conservation of root and tuber crops is a long and intensive process, taking years to complete.

Overall Experience and My Growth

Until my internship in Peru, I had never been involved with laboratory work in a farm setting, nor had I ever worked with professionals in this type of effort. I gained a lot of knowledge about the farming operations in a totally different culture and the wonderful scientific research that is occurring to help people around the world grow better crops and to preserve the numerous potato varieties in Peru from extinction.

And finally, as I look back, I wish that some of the wealthy countries like the United States and Norway would invest more money so that all of the people in Peru could have a better infrastructure including roads, railroad, bridges, water and sewage facilities, manufactured goods, appliances, tractors, cars and trucks like we enjoy. This would assist in making jobs more readily available and would then in turn provide money for food and goods. It would take a lot of money to make this happen, but it would pay off in the long run and extreme poverty might be significantly reduced. Ultimately, we would all benefit.

